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FASTER PROCESSING OF COLOR POSITIVE FILM,(U)

MAY 77 S Y TIKHONOVICH, L S SEVASTYANOVA

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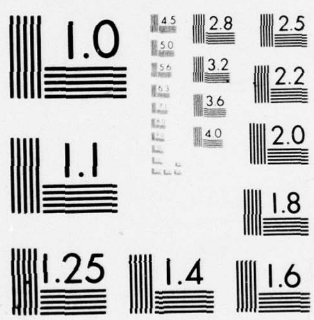

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FASTER PROCESSING OF COLOR POSITIVE FILM

by

S. Ye. Tikhonovich, L. S. Sevast'yanova

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FASTER PROCESSING OF COLOR POSITIVE FILM

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В в	*В в*	V, v	Т т	*Т т*	T, t
Г г	*Г г*	G, g	У у	*У у*	U, u
Д д	*Д д*	D, d	Ф ф	*Ф ф*	F, f
Е е	*Е е*	Ye, ye; E, e*	Х х	*Х х*	Kh, kh
Ж ж	*Ж ж*	Zh, zh	Ц ц	*Ц ц*	Ts, ts
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И и	*И и*	I, i	Ш ш	*Ш ш*	Sh, sh
Й й	*Й й*	Y, y	Щ щ	*Щ щ*	Shch, shch
К к	*К к*	K, k	Ъ ъ	*Ъ ъ*	"
Л л	*Л л*	L, l	Ы ы	*Ы ы*	Y, y
М м	*М м*	M, m	Ь ь	*Ь ь*	'
Н н	*Н н*	N, n	Э э	*Э э*	E, e
О о	*О о*	O, o	Ю ю	*Ю ю*	Yu, yu
П п	*П п*	P, p	Я я	*Я я*	Ya, ya

*<u>ye</u> initially, after vowels, and after ъ, ь; <u>e</u> elsewhere. When written as ё in Russian, transliterate as yё or ё. The use of diacritical marks is preferred, but such marks may be omitted when expediency dictates.

GREEK ALPHABET

Alpha	Α	α	α		Nu	Ν	ν	
Beta	Β	β			Xi	Ξ	ξ	
Gamma	Γ	γ			Omicron	Ο	ο	
Delta	Δ	δ			Pi	Π	π	
Epsilon	Ε	ε	ϵ		Rho	Ρ	ρ	ϱ
Zeta	Ζ	ζ			Sigma	Σ	σ	ς
Eta	Η	η			Tau	Τ	τ	
Theta	Θ	θ	ϑ		Upsilon	Υ	υ	
Iota	Ι	ι			Phi	Φ	φ	ϕ
Kappa	Κ	ϰ	κ	ϰ	Chi	Χ	χ	
Lambda	Λ	λ			Psi	Ψ	ψ	
Mu	Μ	μ			Omega	Ω	ω	

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English
sin	sin
cos	cos
tg	tan
ctg	cot
sec	sec
cosec	csc
sh	sinh
ch	cosh
th	tanh
cth	coth
sch	sech
csch	csch
arc sin	$\sin^{-1}$
arc cos	$\cos^{-1}$
arc tg	$\tan^{-1}$
arc ctg	$\cot^{-1}$
arc sec	$\sec^{-1}$
arc cosec	$\csc^{-1}$
arc sh	$\sinh^{-1}$
arc ch	$\cosh^{-1}$
arc th	$\tanh^{-1}$
arc cth	$\coth^{-1}$
arc sch	sech^{-1}
arc csch	csch^{-1}

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rot	curl
lg	log

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FASTER PROCESSING OF COLOR POSITIVE FILM

S. Ye. Tikhonovich, L. S. Sevast'yanova

In recent years the Soviet movie industry has created a number of different types of color positive film for cinematography (TsP-3; TsP-7; TsP-8; TsP-8r).

However, despite the significant difference in the thickness of emulsion layers, the arrangement of them, their granularity, and physicomechanical and other properties, the same regimes are still recommended for development of these films.

One might assume that for TsP-8r, which has relatively thin

emulsion layers, a low degree of hardening and fine granularity, it would be possible to reduce the period of the individual processing stages. Posed in the first stage was the problem of speeding up the process by 20o/o.

In further defining the processing regimes particular attention was given to rinsing quality, which influences the permanence of the dye materials and the stability of the obtained prints.

Development

According to MRTU 6-17-208-66 film TsP-8r should be developed for 8-10 minutes at pH = 10.4-10.7 and a temperature of 20 ± 0.3°.

The development process can be speeded up by increasing the temperature and pH of the developer.

It was not possible to speed up the process by significantly increasing the temperature of the processing solutions because of the low degree of hardening of the emulsion layers of TsP-8r. Laboratory experiments showed that increasing the temperature of the developer by 2° for most tested reels resulted in a 0.2-0.4 increase in color densities. In individual cases an increase in fog density was

sometimes observed.

On the print fabric the pH of the developer usually remained in the range of 10.4-10.5, in some cases - even 10.3-10.4, which corresponds to the equilibrium concentration of the hydrogen ion which is established in the tanks of the developing machine, provided there is no caustic alkali in the additive.

Laboratory and industrial experience has shown that oscillations in the pH between 10.4 and 10.8 cause changes of 0.3-0.5 (when D = 2.0-2.5) in the color densities of each layer, which practically coincide with the 2 minute change in the development period.

Prints obtained under the usual conditions and developed for 10 min at pH = 10.4-10.5 and 8 min at pH = 10.7-10.8 proved to be visually identical when viewed on parallel screens.

Measurements of sensitograms which were processed simultaneously with the prints showed that the sensitometric parameters were identical.

Table 1 shows the results of measuring three sensitograms developed at pH = 10.4-10.45 for 10 min (I) and at pH = 10.7-10.8 for 8 min (II).

Experience has shown that because of the high buffering power of the color developer its pH can be easily maintained accurate to within $\pm$0.05. In order to attain the necessary pH value of the developer it is necessary to introduce caustic soda on the order of 2.5-3.0 g/l into the additive.

Fixation

We know that fixation time must be at least twice the time of clearing. For this reason the time of clearing was determined for the first and second fixation.

Under laboratory conditions the clearing period of film TsP-8r was determined (10 reels of different batches) in industrial fixing agents, taken from the tanks of developing machines whose composition conforms to MRTU 6-17-208-66.

After development, clearing begins within 2 min 10 s-2 min 20 s. Clearing in the second fixation begins within several (10-15) seconds, since after bleaching the amount cf silver salts remaining in the color image is relatively lcw.

Therefore, an adequate period for the first fixation can be considered 4 min 30 s-5 min (as opposed to the 6-8 min recommended by MRTU).

For the second fixation 1 min is quite adequate (according to MRTU the length of the second fixation should be 4 min).

Bleaching

To determine the length of the bleaching process under laboratory conditions the kinetics of bleaching in a solution taken from the tanks of the developing machine, corresponding to the specifications of the MRTU, were determined.

Bleaching completeness was determined by the magnitude of residual silver density (D_{Ag}) for a density in the coloring material of $D_{цв}$ close to three.

Quantity D_{Ag} was measured on densitometer DEFA behind an infrared light filter.

The density of the coloring material in film TsP-8r was determined behind a blue light filter, since earlier it had been established (by microscopic sections and prints behind three light filters) that in TsP-8r it was most difficult for the silver to bleach in the upper sensitive layer.

The results of the bleaching kinetics for TsP-8r (reels 33995) are shown in Table 2.

From the table it is apparent that when the density of the yellow coloring material is 2.95 (5th field of the sensitogram) 2 minutes is sufficient for complete bleaching of the silver in the image.

The low measured optical density is apparently explained by the presence of silver sulfide, which is formed during the fixation process [1] and by a certain nontransmission of color agents in the infrared region.

Verification of different TsP-8r film batches (10 reels) showed that bleaching completeness is attained with processing of 1 min 30 s-2 min.

Here the optical density of the residual silver D_{Ag} did not

exceed 0.07-0.12 (according to RTL 19-3-70 D_{Ag}=0,12 is permitted) and was the same as the density obtained during bleaching for 4 and 5 min (according to MRTU the bleaching period is 4 min).

Rinsing

To a great extent the rinsing process determines the quality of the image and the sound track, since on it depends the fog, the permanence of the coloring agent in the positive, and the stability of the processing solutions. Rinsing speed is influenced by a number of factors, the most important of which include: diffusion resistance, which is overcome by the particles of the rinse substances; the reaction between these particles and the gelatine, temperature and pH of rinsing water, concentration of salts in water, hydrodynamic rinsing regime, etc. [2, 3, 4, 5]. However, the rules usually specify only duration and water temperature in rinsing. With respect to other monitoring methods there are recommendations only for the residual thiosulfate in the process film, which describes the quality of the last rinse.

In order to establish the possibility of reducing the duration of the other rinses it was necessary to develop methods for monitoring these stages.

Inadequate rinsing quality after development usually causes increased density in the coloring agent and fog. This is explained by the fact that the rinse-water tank can accumulate the substances contained in the developer, and the solution thus formed may begin to perform a predevelopment function. The difference in the rate of diffusion of bromides and para-aminodiethylaniline (TsPV-1) affects the raising of the fog as a result of so called "bromide-free development."

The increase in the fog is also influenced by an increase in the concentration of TsPV-1 in the first fixation, which results from poor rinsing.

A three-month industrial test showed that in the rinse tank after development the pH of the water changed from 7.3 to 10.7, the concentration of TsPV-1 - from 0 to 0.1 g/l and the concentration of sodium carbonate - from 0 to 2.6 g/l.

In analyzing the obtained information it becomes clear that the most probable is a change in the pH from 9.3 to 10.3 (80o/o of cases), in the concentration of TsPV-1 - from 0 to 0.02 g/l (72o/o of cases), and in the concentration of potassium carbonate - from 0.5 to

1.0 g/l (76o/o of cases).

Laboratory experiments showed that the change in the value of coloring agent density is in direct relation to the pH of the water in the first rinse tank. Table 3 shows results obtained in processing one TsP-8r spool. For different spools and batches of TsP-8r the value $\Delta D_{жвг}$ varies approximately from 0.2 to 0.6.

The change in the concentration of TsPV-1 from 0 to 0.1 has no effect on the sensitometric indicators of the film (Table 4). The latter is probably explained by the fact that when it emerges from the developer the film has a sufficiently high quantity of TsPV-1, which is diffused from the layer in water at a rate considerably slower than that of potassium carbonate and bromides.

Based on the above we can assume that to estimate the quality of the first rinsing it is best to determine the pH of the water in the rinse tank, the concentration of potassium carbcnate, and the intensity of the flow. In the first fixing agent the concentration of TsPV-1 should be monitored.

In the case of poor rinsing thiosulfate and the developing substance can accumulate in the bleaching solution after the first fixation.

The presence in the bleaching bath of even a small quantity of thiosulfate results in a noticeable decrease in silver density values in the sound track. Practice and laboratory experiments have shown that when the bleaching solution contains 0.5 g/l thiosulfate the value of D_{Ag} in the color-silver sound track decreases by 0.15-0.2; when 5 g/l thiosulfate is present the metallic silver is dissolved completely. In analyzing bleaching solutions on various print fabrics thiosulfate (up to 1.6 g/l) was detected in individual cases.

Moreover, poor rinsing can be the reason for increased fog (so called *"bleaching fog"*).

Experiments have shown that an inadequate second rinsing can cause the following increase in D_0:

$$\Delta D_{ж} = 0,02 - 0,03; \quad \Delta D_{п} = 0,05 - 0,07;$$
$$\Delta D_{г} = 0,06 - 0,12.$$

The presence in the bleaching solution of even traces of TsPV-1 causes a noticeable increase in the fog.

Laboratory experiments showed that when the pH of the bleaching solution is below 6.5-7.0 the developing agent may remain in it for several days. According to MRTU the pH of the solution must be

maintained between 5.6 and 7.0.

However, in further defining the length and intensity of the second rinsing, it is sufficient to determine the concentration of thiosulfate in the last rinse tank. The concentration of TsPV-1 need not be determined, since it depends on the amount of fixing agent which has accumulated. Even traces of thiosulfate in the water means that the quality of the rinse is poor.

After bleaching the rinse water was checked for the concentration of potassium ferricyanide in it.

After the final rinse the presence of residual thiosulfate in the processed film was determined.

As a result of long-term industrial checking it has been established that the length of the rinses can be significantly reduced without impairing the quality of the image.

New Processing Regime

Based on this study a new processing regime was created which speeded up the process by 20o/o (Table 5).

Since PTs-7 is developed together with TsP-8r on the same machine, the new specification was carefully tested for processing color positive film ORVO. The changes in the processing conditions provided in the new regime were not reflected in the sensitometric indicators of the developed PTs-7 or visual perception of the color image obtained on this film.

Table 6 shows the sensitometric characteristics of film PTs-7 ORVO, processed in the old (I) and new (II) regimes on developer 10P-30.

The development period in the first case is 10 min at pH = 10.4-10.5, in the second - 8 min at pH = 10.7-10.8.

In addition to a visual and sensitometric estimate of image quality, the permanence of the coloring agents in the positive was tested. For this purpose specimens of film PTs-7 ORVO and TsP-8r (5 reels each), processed in developer 10P-30 according to MRTU 6-17-208-66 and the new regime (see Table 5), were placed for one year in metal containers and stored at room temperature and were also subjected to thermostatic control for a certain period of time at a temperature of 80° and a humidity of 75o/o [6].

The preservability of the color image was evaluated by the difference in optical densities of the coloring agents of each layer measured before and after storage ($\Delta D_{жпг}$).

The experiments revealed an identical change in the optical densities for both processing regimes. After being stored for one year the color densities of film PTs-7 have not changed. In film TsP-8r only the density of the light blue coloring agent declined (by 0.1-0.2). Thermostatic control of both films for 65 h at a temperature of 80° and 75o/o humidity caused a decrease in color densities in all layers.

In film TsP-8r: $\Delta D_{ж}=0{,}15-0{,}2$; $\Delta D_{п}=0{,}2-0{,}3$; $\Delta D_{г}=0{,}3$.

In film PTs-7 ORVO: $\Delta D_{ж}=0{,}15-0{,}2$; $\Delta D_{п}=0{,}1-0{,}2$; $\Delta D_{г}=0{,}2-0{,}3$.

The new specification has already been used for two years in shop No. 2 of the Main Works of the Subdivision "Kopirfil'm" (formerly the Moscow Movie Print Factory).

The faster pace of the developing machines has made it possible

for the shop to move to a two-shift operation and somewht reduce expenditures by stabilizing the process while preserving the quality of film prints.

Subdivision "Kopirfil'm"

BIBLIOGRAPHY

1. Миз К., Теория фотографического процесса, Гостехтеоретиздат, 1949.
2. Блюмберг И. Б., Технология обработки фотокиноматериалов, М., «Искусство», 1967.
3. Ляликов К. С., Теория фотографических процессов, М., «Искусство», 1960.
4. Lloid E., Photogr. Sci. Eng., 1959, 3, No. 6; 1965, 9, No. 6.
5. Сб. «Современное развитие фотографических процессов», М., «Искусство», 1960.
6. Кириллов Н. И., Войцеховская А. М., Кириллова Н. Е., Успехи научной фотографии, VII, 1960.

Table 1. Key: (1) No. of sensitogram.

Table 2. Key: (1) No. of field, (2) Bleaching period, min.

Table 3. Key: (1) layer, (2) density.

Table 4. Key: (1) Concentration, (2) TsPV-1, 0 g/l, (3) TsPV-1, 0.04 g/l, (4) TsPV-1, 0.09 g/l, (5) layer, (6) density.

Table 1.

(1) № сенситограммы	I			II		
	Ж	П	Г	Ж	П	Г
	D_K					
1	2,15	1,95	1,95	2,10	1,94	1,90
2	2,06	1,92	1,86	2,00	1,90	1,80
3	1,96	1,87	1,82	1,95	1,80	1,80
	D_0					
1	0,19	0,17	0,12	0,18	0,18	0,13
2	0,18	0,18	0,13	0,18	0,18	0,13
3	0,18	0,18	0,13	0,19	0,18	0,13
	γ					
1	3,5	3,4	3,2	3,4	3,3	3,2
2	3,3	3,1	3,0	3,3	3,0	3,0
3	3,5	3,3	3,2	3,4	3,3	3,2

Table 2.

(1) № поля	$D_Ж$	D_{Ag}				
		(2) Продолжительность отбеливания, мин				
		1	2	2,5	3	5
5	2,95	0,20	0,10	0,10	0,10	0,1
6	2,45	0,16	0,11	0,11	0,11	0,11
7	1,85	0,14	0,12	0,12	0,12	0,12
8	1,35	0,13	0,12	0,12	0,12	0,12
9	0,95	0,12	0,11	0,11	0,11	0,11
10	0,66	0,10	0,10	0,10	0,10	0,10
11	0,45	0,08	0,08	0,08	0,08	0,08

Table 3.

pH	7,5			10,3		
(1) слой / (2) плотность	Ж	П	Г	Ж	П	Г
D_1	2,05	1,90	2,14	2,65	2,35	2,56
D_2	1,67	1,50	1,66	2,12	1,80	2,11
D_0	0,13	0,13	0,10	0,14	0,14	0,10

Table 4.

(1) Концентрация	(2) ЦПВ-1, 0 г/л			(3) ЦПВ-1, 0,04 г/л			(4) ЦПВ-1, 0,09 г/л		
(5) слой / (6) плотность	Ж	П	Г	Ж	П	Г	Ж	П	Г
D_1	2,20	2,20	2,18	2,18	2,20	2,15	2,20	2,20	2,20
D_2	1,72	1,70	1,70	1,7	1,69	1,71	1,7	1,69	1,69
D_0	0,13	0,10	0,09	0,14	0,11	0,09	0,13	0,11	0,09

Table 5. Key: (1) Technological operation, (2) Processing regimes corresponding to MRTU6-17-208-66, (3) New recommended processing regime, (4) New processing regime on developer MKP, (5) Development, (6) min, (7) s, (8) rinsing, (9) No more than, (10) Fixation, (11) Rinsing, (12) Bleaching, (13) Rinsing, (14) Development of sound track, (15) Per RTM-KINO 122-66, (16) Rinsing, (17) Not indicated, (18) Fixation, (19) Rinsing, (20) Final results.

Table 5.

(1) Технологическая операция	(2) Режимы обработки, соответствующие МРТУ6-17-208-66	(3) Новый рекомендуемый режим обработки	(4) Новый режим обработки на проявочной машине МКФ
(5) Проявление	(6) 8—10 мин	8—9 мин	8 мин 30 (7) сек
(8) Промывание	(9) Не более 1 мин	Не более 1 мин	45 сек
(10) Фиксирование	6—8 мин	5—6 мин	5 мин 30 сек
(11) Промывание	10—12 мин	8—9 мин	8 мин 20 сек
(12) Отбеливание	4 мин	2 мин 30 сек	2 мин 30 сек
(13) Промывание	3 мин	3 мин	3 мин
(14) Проявление фонограммы		(15) Соответственно РТМ-КИНО122-66	
(16) Промывание	(17) Не указано	30 сек	30 сек
(18) Фиксирование	4 мин	1—2 мин	2 мин 30 сек
(19) Промывание	10—15 мин	7—8 мин	7 мин 30 сек
(20) Итого:	45—56 мин	36—41 мин	38—39 мин

Table 6.

I			II		
Ж	П	Г	Ж	П	Г
	$D_к$			$D_к$	
2,00	1,87	1,84	2,03	1,88	1,84
2,10	1,94	1,90	2,15	1,95	1,95
2,14	1,95	1,90	2,18	2,09	1,95
	D_0			D_0	
0,21	0,20	0,14	0,19	0,17	0,13
0,18	0,18	0,13	0,19	0,17	0,012
0,19	0,18	0,13	0,18	0,16	0,12
	γ			γ	
3,4	3,3	3,2	3,5	3,4	3,2
3,3	3,0	3,0	3,3	3,1	3,0
3,4	3,3	3,2	3,4	3,3	3,2

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